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EXAMINER

KIM, TAE JUN

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Paper No. 20

Application Number: 09/545,554
Filing Date: April 07, 2000
Appellant(s): HOOK ET AL.

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GROUP 3700

Robert Reeser, III
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 7/22/02.

(1) *Real Party in Interest*

A statement identifying the real party in interest is contained in the brief.

(2) *Related Appeals and Interferences*

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

(3) *Status of Claims*

The statement of the status of the claims contained in the brief is correct.

(4) *Status of Amendments After Final*

No amendment after final has been filed.

(5) *Summary of Invention*

The summary of invention contained in the brief is correct.

(6) *Issues*

The appellant's statement of the issues in the brief is substantially correct. The 2nd issue has been amended due to the withdrawal of the Maslak reference, whose teachings are merely additive in nature.

Issue B Whether Claims 5, 12-14, 18-20 are unpatentable under 35 U.S.C. 103(a) as being unpatentable over Schilling et al (US 5,630,319) in view of either Horner et al (US 5,274,995) or Borkowicz et al (US 5,259,184) and further in view of Talabisco et al (US 5,357,741).

(7) *Grouping of Claims*

Appellant's brief includes a statement that each group of independent claims stand or fall together.

(8) *Claims Appealed*

The copy of the appealed claims contained in the Appendix to the brief is correct.

(9) *Prior Art of Record*

5,630,319	SCHILLING et al	05-1997
5,274,995	HORNER et al	01-1994
5,259,184	BORKOWICZ et al	11-1993
5,351,477	JOSHI et al	10-1994
5,357,741	TALABISCO et al	10-1994

(10) *Grounds of Rejection*

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1-4, 6, 8-11, 15-17 are rejected under 35 U.S.C. 103(a) as being unpatentable over Schilling et al (5,630,319) in view of either Horner et al (5,274,995) or Borkowicz et al (5,259,184). Horner teaches a combustor having 3 domes 61, 63, 65 and incorporating dual fuel premixers in each dome, i.e. of the type utilized by Joshi et al 5,351,477, *which is incorporated by reference* (see col. 3, 1st few lines) and hence operate fuel lean, i.e. operate with a fuel/air mixture equivalence ratio of less than one (see col. 6, lines 4+ of Joshi et al 5,351,477). Schilling does not teach water injection into the premixers. Horner et al teach a

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combustor dome 22 for a gas turbine combustor having using water injection into a premixer 22 (col. 5, lines 12-16) and where the water injection reduces the temperature and thus the emissions, including NOx emissions.

“Premixing the air and fuel in the manner shown facilitates reducing CO and NOx emissions. This feature may be further enhanced by providing a fuel nozzle (not shown) which supplies a premixture of fuel and steam.” (see col. 5, lines 12-16)

“The swirler 38 is capable of receiving fuel nozzle 26 (FIGS. 1-4) through a supply or opening in the center of the swirler 38. The fuel nozzle supplies both fuel and water to combustor dome assembly 22 and to combustion chamber 14. **Supplying both fuel and water to combustion chamber 14 has the advantage of permitting fuel to be ignited in combustion chamber 14 while the water reduces the temperature of the combustion, thereby reducing undesirable emissions, such as NOx.** FIG. 2 illustrates the injection of water and fuel into venturi 40 thereupon it is caused to swirl in a frusto-conical manner 46 by the swirling airflow provided by the swirler 38. As swirling water is forced against inner surface 40c under centrifugal force, it forms a thin film of water 52 along the inner surface 40c of venturi 40. The thin film of water 52 flows along the inner surface 40c towards downstream end 40b.” (see col. 3, lines 29-45)

Borkowicz et al also teach that it is old and well known in the gas turbine premixers 46 to inject water from passage 94, 98 to reduce the NOx emissions using a dual fuel nozzle.

“The fuel nozzle assembly 32 is also provided with a further passage 94 for (optionally) supplying water to the burning zone to effect NOx reductions in a manner understood by those skilled in the art. The water passage 94 is defined between tube 86 and adjacent concentric tube 96. Water exits the nozzle via an orifice 98, radially inward of the atomizing air orifice 88.” (see col. 6, lines 41-48)

Hence, Horner et al and Borkowicz each teach that it is old and well known in the art to employ water/steam injection into the premixer of a gas turbine combustor in order to lower NOx emissions and/or CO emissions. It would have been obvious to one of ordinary skill in the art to employ water/steam injection with the premixers of Schilling et al, in order to facilitate low emissions.

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Claims 5, 12-14, 18-20 rejected under 35 U.S.C. 103(a) as being unpatentable over Schilling et al (5,630,319) in view of either Horner et al (5,274,995) or Borkowicz et al (5,259,184), as applied above and further in view of Talabisco et al (5,357,741). The prior art teach various aspects of applicant's claimed invention but do not explicitly teach the water delivery system operable in first and second mode relative to a predetermined value. Talabisco et al teach that it is old and well known in the art to control the steam/water based on the load, among other variables (see abstract and see col. 6, lines 62-68).

FIG. 2 is a graph that shows the steam-to-fuel ratio as a function of turbine firing temperature (T_5) for a given relative humidity, fuel gas composition and ambient temperature (100.degree. F.). The graph further shows that the steam-to-fuel ratio is a linear function of load since load can be directly correlated to turbine firing temperature T_5 . (see (col. 6, lines 62-68).

This citation specifically teaches that when the load increases, the steam increases with the load¹, and hence any arbitrary point, including the 90% load point, can be considered the predetermined point for the sake of the claims for which the 2nd mode of operation is in effect. It would have been obvious to one of ordinary skill in the art to control the steam/water injection by using a first and second mode with a predetermined value, as taught by Talabisco et al, as being a notoriously old and well known method utilized in the art for controlling the water injection. As for the set point being greater than 90 percent of the rated power capability, that is within the ordinary skill in the art, as an obvious matter of finding the workable ranges in the art. Furthermore, for claim 5, all

¹ Note that the steam/fuel ratio is increasing with the load (temperature) and the fuel is also increasing with the load (temperature) due to thermodynamics. Hence, the steam is increasing with respect to the load, in order for the steam/fuel ratio to be increasing with the load (temperature).

that is required is that water be injected at greater than 90% of the load. At near full load, that is when the temperatures are highest, as shown in Fig. 2 of Talabisco et al, and water injection most needed for its temperature reduction and NOx reduction. It would have been obvious to one of ordinary skill in the art to employ water injection at loads greater than 90% to reduce the temperature and NOx levels of Schilling et al.

(11) Response to Argument

Applicant's keystone arguments are the alleged use of impermissible hindsight and alleged lack of motivation. In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971). In this case, the teachings are clear, both Horner et al and Borkowicz et al expressly teach employing water/steam injection into the premixer of a gas turbine combustor in order to lower NOx emissions and/or CO emissions. Thus the motivation to combine the references is clearly stated by the references. Moreover, applicant argues that Joshi teaches away from the claimed combination but does not provide proper contextual quotation from Joshi, see paragraph bridging pages 19-20 of the brief, i.e.

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“While premixing ducts in the prior art have been utilized in lean burning designs, they have been found to be unsatisfactory due to flashback and auto-ignition considerations for *modern* gas turbine applications.” (emphasis added by Examiner, col. 1, lines 55-59).

However, it is noted that both Borkowicz et al and Horner et al were filed in 1992 and published in 1993, which is contemporaneous with Joshi, which was filed in 1993 and patented in 1994. Hence, both of these would be considered in the *modern* class of gas turbine applications and hence not subject to the flaws discussed with regard to some of the prior art. Moreover, applicant’s arguments are unpersuasive as the goal is not to modify either Borkowicz et al or Horner et al, but modification of Schilling et al (incorporating Joshi et al) for water injection. Hence, Joshi does not teach away from the claimed combination in any manner whatsoever. Moreover, it is also noted that Joshi teaches that including water injection equipment is conventionally used in the prior art for reducing NOx emissions with the only penalty being the use of ancillary equipment, i.e. more equipment (col. 1, lines 25-35). Note that Borkowicz et al teach a premixed combustor with low NOx emissions, without the use of the water injection, but that with water injection emissions are lowered even more. Borkowicz teaches the combustor is

“a new *dry* low NOx [premixed] combustor” (col. 2, lines 21-22) and that

“The fuel nozzle assembly 32 is also provided with a further passage 94 for (optionally) supplying water to the burning zone *to effect NOx reductions in a manner understood by those skilled in the art*. The water passage 94 is defined between tube 86 and adjacent concentric tube 96. Water exits the nozzle via an orifice 98, radially inward of the atomizing air orifice 88.” (see col. 6, lines 41-48)

However, with regard to Horner et al, applicant’s contention that water injection is optional is unfounded and unsupported by the specification of Horner et al. Hence, it is clear that even with combustors that are already dry low NOx combustors (e.g. the

aggregate of Schilling and Joshi et al), water injection would serve to lower the NO_x emissions even more. Note that lowering NO_x emissions is not merely desirable but legislatively imposed upon the power generating industry².

Applicant's arguments regarding Schilling and Joshi et al represent a fundamental misunderstanding of these references, arguing as if Joshi et al were independently applied. Schilling et al incorporate Joshi et al by reference (see col. 3, 1st few lines) for the premixer structure and hence the entire disclosure of Joshi et al, including the lean burning (equivalence ratio of less than one) operation, is present in Schilling et al's disclosure.

Furthermore, applicant's arguments with regard to lean burning premixed combustion are not persuasive, as this is the conventional practice in the art, due to its lower NO_x and CO emissions. This is fairly taught by Joshi et al (col. 6, lines 4-12).

With regard to Issue B, i.e. with the addition of the Talabisco et al reference, it is noted that Talabisco et al clearly teach one of ordinary skill in the art the claimed operational modes and hence applicant's allegation of the mere assertion of obviousness is clearly unfounded. Talabisco et al teach that it is old and well known in the art to control the steam/water based on the load, among other variables (see abstract and col. 6, lines 62-68).

²In the US, Congress has mandated reducing various levels of emissions via the various Clean Air Acts. State Governments, e.g. California, have legislated their own emissions standards, which can be even more stringent.

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FIG. 2 is a graph that shows the steam-to-fuel ratio as a function of turbine firing temperature (T_5) for a given relative humidity, fuel gas composition and ambient temperature (100.degree. F.). The graph further shows that the steam-to-fuel ratio is a linear function of load since load can be directly correlated to turbine firing temperature T_5 . (see col. 6, lines 62-68).

This citation specifically teaches that when the load increases, the steam increases with the load, and hence any arbitrary point, including the 90% load point, can be considered the predetermined point for the sake of the claims for which the 2nd mode of operation is in effect. Furthermore, for claim 5, all that is required is that water be injected at greater than 90% of the load. At near full load, that is when the temperatures are highest, as shown in Fig. 2 of Talabisco et al, and water injection needed for its temperature reduction and NOx reduction. Clearly, use above this range is within the ordinary skill in the art.

In conclusion, it is noted that appellant's arguments are not persuasive as the references contain express teachings/motivation to combine, i.e. to reduce the NOx and/or CO emissions. Furthermore, appellant's misunderstanding of the incorporation by reference of Joshi et al into the Schilling et al reference militates against his line of argumentation. Appellant's arguments fail to effectively rebut the Examiner's position that employing water injection in the lean burning premixers of the prior art would have been obvious to one of ordinary skill in the art to reduce the NOx emissions thereof.

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For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,



Ted Kim

Primary Examiner

September 2, 2002

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